Customer No.: 31561
Application No.: 10/709,334
Docket No.: 13031-US-PA

AMENDMENT

Please amend the application as indicated hereafter.

In the Claims :

1. (original) A superjunction Schottky device, comprising:

a back metal layer;

a semiconductor substrate of a first conductivity type on the back metal layer;

a plurality of superjunction cells on the semiconductor substrate, including a plurality of charge-balance layers that extend substantially vertically;

a lightly-doped junction barrier Schottky (JBS) region of the first conductivity type on each superjunction cell; and

a front conductor layer over the substrate, contacting with the JBS region to form a Schottky contact with the JBS region.

2. (original) The superjunction Schottky device of claim 1, further comprising a plurality of isolation structures, wherein each isolation structure is between two superjunction cells and between two JBS regions.

3. (original)The superjunction Schottky device of claim 2, wherein each isolation structure comprises a material selected from the group consisting of doped and undoped oxide, nitride and polysilicon, and combinations thereof.

4. (original)The superjunction Schottky device of claim 2, wherein each superjunction cell comprises a first layer of a second conductivity type, a second layer of the first conductivity type, a lightly-doped third layer of the first conductivity, a fourth

layer of the first conductivity type and a fifth layer of the second conductivity type arranged in sequence.

5. (original) The superjunction Schottky device of claim 4, further comprising a guard ring of the second conductivity type at periphery of each Schottky contact above a superjunction cell.

6. (original) The superjunction Schottky device of claim 5, wherein the JBS region is contiguous with the third layer of the superjunction cell, and the guard ring is over the first, second, fourth and fifth layers of the superjunction cell.

7. (original)The superjunction Schottky device of claim 2, wherein each superjunction cell comprises a first layer of a second conductivity type, a second layer of the first conductivity type and a third layer of the second conductivity type arranged in sequence.

8. (original) The superjunction Schottky device of claim 7, wherein the JBS region is located on the second layer of the superjunction cell, and the first and third layers of the superjunction cell extend upward to periphery of the JBS region.

9. (original)The superjunction Schottky device of claim 8, further comprising a guard ring of the second conductivity type at periphery of each Schottky contact above a superjunction cell.

10. (original) The superjunction Schottky device of claim 1, wherein the superjunction cells are arranged adjacent to each other.

11. (original) The superjunction Schottky device of claim 10, wherein each superjunction cell comprises a first layer of a second conductivity type, a second layer of

the first conductivity type, a lightly-doped third layer of the first conductivity, a fourth layer of the first conductivity type and a fifth layer of the second conductivity type arranged in sequence.

12. (original) The superjunction Schottky device of claim 11, further comprising a guard ring of the second conductivity type at periphery of each Schottky contact above a superjunction cell.

13. (original)The superjunction Schottky device of claim 12, wherein the JBS region is contiguous with the third layer of the superjunction cell, and the guard ring is over the first, second, fourth and fifth layers of the superjunction cell.

14. (original)The superjunction Schottky device of claim 10, wherein each superjunction cell comprises a first layer of a second conductivity type, a second layer of the first conductivity type, a third layer of the second conductivity type arranged in sequence.

15. (original) The superjunction Schottky device of claim 14, further comprising a guard ring of the second conductivity type at periphery of each Schottky contact above a superjunction cell.

16. (original)The superjunction Schottky device of claim 15, wherein the JBS region is located on the second layer of the superjunction cell, and the guard ring is over the first and third layers and a portion of the second layer of the superjunction cell.

17. (original) The superjunction Schottky device of claim 14, wherein the JBS region comprises a lightly doped region of the first conductivity type over all superjunction cells.

18. (original)The superjunction Schottky device of claim 1, wherein a doping concentration in the superjunction cells ranges from $1\times10^{15}/cm^3$ to $1\times10^{17}/cm^3$.

19. (original) The superjunction Schottky device of claim 1, further comprising an edge termination of the first conductivity type on a peripheral portion of the substrate.

20. (original) The superjunction Schottky device of claim 1, wherein the superjunction cells are located in an epitaxial silicon layer.

21. (original) The superjunction Schottky device of claim 1, wherein the front conductor layer comprises a metal layer forming the Schottky contact with the JBS region.

22. (original) The superjunction Schottky device of claim 1, wherein the front conductor layer comprises a metal silicide layer forming the Schottky contact with the JBS region and a metal layer on the metal silicide layer.

23. (original) The superjunction Schottky device of claim 22, wherein the metal silicide layer contains a metal selected from the group consisting of Au, Pt, Ni, Ti, W, Co, Rh, Pd, Zr, Ta, Cr, Mo and alloys of the above metals with various weight ratios.

24. (original) The superjunction Schottky device of claims 22, wherein the metal layer comprises Al, Al/Si alloy, Al/Si/Cu alloy, Mo/Al alloy, Al/Ni/Au alloy, or Ti/Ni/Ag alloy.

25.-45. (cancelled).